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of discussion. In this connection it may be regretted that, in so useful a book a few technical errors have crept in, as the repeated use of the term "expansion" of the diaphragm when "contraction" is plainly intended. Also the drinking of water with meals is categorically condemned although there is much authority for the opposite contention.

J. A. N.

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*The Reasoning Ability of Children of the Fourth, Fifth, and Sixth School Grades.* By FREDERICK G. BONSER. New York: Teachers College, Columbia University, 1910. Pp. 133.

This monograph gives the results of an experimental study of the abilities of 757 fourth-, fifth-, and sixth-grade children of Passaic, N.J., to use what the author regards as the "most fundamental four phases of reasoning activity," namely, "controlled association, mathematical judgment, selective judgment, and the complex analysis and synthesis found in literary interpretation."

For the test of mathematical judgment fifteen easy problems involving knowledge to be expected of the children were given: for controlled association, (1) a list of twenty sentences requiring that appropriate words be substituted where blanks occurred, (2) twenty sentences requiring the choice of a right or wrong word to make proper sense in each, and (3) sixty words requiring opposites; for selective judgment, (1) the choice of the right reasons from a variety of reasons why certain things are so, and (2) the selection of good definitions from a number of definitions of objects; for literary interpretation, the telling or giving the meaning of two stanzas of poetry.

The author reaches the conclusion that the above tests are valid tests of native reasoning ability, as there is a "progressive development through the grades," as the younger children of a grade are uniformly superior to the older, and as there are "substantial percentages of the lowest grades represented in the highest quartile of ability of all." Mr. Bonser says that the conclusion which is of the greatest pragmatic value is the one drawn from the last two results stated above—that "the worst type of retardation is that which withholds appropriate promotion from those who are the most gifted, therefore of most significance as social capital."

The tests show careful preparation, the conditions under which they were given were kept uniform, and the presentation is thorough and clear. Were the results given in percentages as well as in terms of median abilities the comparison of the tests with each other could be more readily noted. However, the table of correlations brings this out fairly well. Mr. Bonser's results certainly make clear that there is a wide variation in ability in each grade and force the conclusion that the teaching and management of the schools are not meeting the conditions.

Whether the tests employed by the author are adequate for determining the status of reasoning ability is a different question. Can we say that mathematical and selective judgment, controlled association, and the analysis and synthesis found in literary interpretation are the "four fundamental phases of reasoning ability"? Are not the formulation and testing of hypotheses, the establishment of general conclusions, and their verification quite as fundamental?

The motive for reasoning, implicit or explicit, is found in a problematical situation which confronts the individual. Mr. Bonser's tests do not afford this except in a highly artificial and static form. The very fact that the time taken by the first pupil in the room to complete the exercise was made the time limit for all pupils vitiates the value of the test as one for reasoning and makes it rather a test for knowledge and habits that have become automatized. Mr. Bonser comments upon this but does not think that the value of the test for reasoning is lessened thereby. Certainly there must be a stock of knowledge and ability to control associations before reasoning in a given situation can take place, but the mere recall of knowledge through associations is not necessarily a test of reasoning ability, nor does it follow that the associations were built up as a result of reasoning.

The selective judgment and literary interpretation tests are better adapted to call forth reasoning than the controlled association and mathematical judgment tests, but the same objections to the imposed time limit and the lack of a problematic situation apply here also.

The author draws the conclusion that since the younger children in each grade score more points than the older, and since a good percentage of the lower grade children reach the highest quartile of all, the tests are of native as well as of acquired ability. In Test III for controlled association there is such a small gain from grade to grade, and for the younger over the older that it is barely noticeable. This may indicate that the knowledge required by the test was acquired early and had reached a high degree of automatization in the lowest grade. On the other hand, Test IV for controlled association shows a marked gain from year to year and for the younger over the older, and may be interpreted as meaning simply that the information necessary for the solution of this test had not yet been acquired as habit in the lower grades. The fact that there is a marked gain in Grade 5B over 4A for both younger and older children may mean that this information was a part of the teaching of Grade 5B.

There is only from four to six months' difference between the average age of the younger 25 per cent of Grade 4A and that of Grade 5A, and three months between the older groups of the same grades. Despite the small difference in age Test IV shows an appreciable difference in ability between these two grades, being about the same for the younger as for the older groups. This would seem to indicate that the difference is due largely to school training.

Perhaps the effects of retardation have not sufficiently entered into the author's conclusions. Making the very liberal allowance of three years to a grade, eight to eleven years for Grade 4, and so on, from 30 to 40 per cent of the children are above age. Taking the ages nine to ten for Grade 4, ten to eleven for Grade 5, and eleven to twelve for Grade 6, out of 757 children only 20 are below the normal age. Hence the younger 25 per cent represents the normal-age group, while the older 25 per cent consists of very much retarded children. The difference in ability found between the younger and older groups does not necessarily indicate that these tests are of native reasoning ability; they may be interpreted as simply indicating that the normal-age or younger group was able to automatize acquired knowledge more quickly than the older, retarded group.

In a study of this kind information in regard to when and where the children received definite training along the lines of knowledge required by the tests might

throw some light upon the interpretation of the results in terms of native and acquired ability.

The conditions under which the author worked seem to the reviewer to be too complicated for obtaining valid information concerning the reasoning ability of children. Children should be studied in groups of the same age and ability. Individual records should be kept. A suitable situation should confront the children involving a problem known to be new to them and for the solution of which they have an adequate stock of old knowledge. The reasoning process itself must be studied as well as the results of learning, for the learning may or may not have involved reasoning.

M. A. GRUPE

THE UNIVERSITY OF CHICAGO